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GEODETIC SURVEYING, TOPOGRAPHICAL WORK, AND MAP-MAKING IN MADAGASCAR, 1903.

BY

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The year 1903 was a peculiarly fertile one in work pertaining to surveying, topographical, and ordnance maps in the different districts of Madagascar, by some of the most experienced and able officers of the army of occupation.

To speak first of the geodetic survey of Madagascar. This has been carried out by three triangulations—one central, a line being drawn from Diego Suárez in the extreme north to Fort Dauphin, the two others along the coasts, and all connected by transversal section lines, so as to cover the whole island with a network of outlines, leaving the intermediate spaces to be filled up later on as information is forthcoming. Of these three systems of triangulation the central one and the west coast one (from Mojanga to St. Mary's Island) were surveyed previous to 1902. The third, which skirts the east coast, was undertaken in 1902, and surveyed over a distance of 106 miles, from Andovoranto to Mananjary, by officers of the French Colonial Artillery. Last year's work included the prolongation of this line from Mananjary southwards as far as Fort Dauphin, a distance of 248 miles, where it joined the central line drawn from Diego Suarez to that place; and the completion of a transversal section line from Fianarantsoa to Mananjary, which had been commenced in 1900.

The whole work was divided into four sections, and was carried out under the direction of Captain Milhau, an able infantry officer.

The new triangulation, comprising triangles with length of sides about 12 to 18 miles, and completed by a close network with the intermediate points, is joined to the north through Mananjary to the extremity of the portion of the line already drawn, and to the south it joins the central triangle, one of the sides of which was taken as a base.

This work, by ensuring the position of a great number of fresh points, has been the means of determining in a definite manner the outline of the east coast, about which the old maps were frequently in doubt. It also helped to establish the correctness of the preceding triangulations, which in many points coincided perfectly with the new calculation.

The Reverend Father Colin, a missionary of the Society of Jesus, who has lived in the island for more than thirty years, the director and, in fact, the originator of the Ambohidempona Observatory near Antananarivo, is probably the most able mathematician that Madagascar has ever known, and, while still devoted to his works on meteorology and magnetism, has completed a very close triangulation of the west of Antananarivo. This will serve as a base for surveying the environs of the capital with a very long radius.

While the geodetic officers were carrying out these triangulations, the Topographical Department was preparing a rough plan of the districts traversed on a scale of $\frac{1}{100000}$. Three lieutenants of infantry prepared respectively maps of Fianarantsoa, the province of the same name, and the province of Mananjary, and fixed for a long time the topography of those regions. Captain Sancery was entrusted with a similar task for the province of Tamatave, and surveyed the valleys of the rivers Ivoloña and Ifontsy, carrying the triangulation of the East to the last-mentioned river. At the same time officers of the Antananarivo garrison made a plan of that city and suburbs with a 12-mile radius on the scale of $\frac{1}{50000}$. This work was based on the existing triangulation. Father Roblet, following up his topographical survey of Imerina, the central province, to which he devoted years of labour long before the French took possession of the island, has been revising many parts of his observations, particularly near the river and sources of the Onivé, a tributary of the Mangoro, which runs into the sea at Mahanoro (east coast).

A great number of plans and itineraries in various parts of the island have been added to the documentary geography of Madagascar. Some have made us acquainted with still unexplored regions; others have corrected old documents. Amongst the more important of these works may be mentioned a fairly complete map on a scale of $\frac{1}{200000}$ of the district of Fort Dauphin; another of the province of Fianarantsoa on a scale of $\frac{1}{100000}$; and a very exact map of Diego Suarez, destined to be the naval defence of the East Indian station; maps, also, of the province of Mananjary, Bemaraha, and Bongo Lava—names which convey little to the ordinary reader, but which bear witness to the thorough attention devoted to the scientific geographical knowledge of the island. Not to be omitted is a map of the district of Morondava on the southwest coast, contributed by the Compagnie Lyonnaise, a commercial company.

The chiefs of provinces and districts, responding to requests made by the Governor-General Gallieni, have sent in to the Topographi-

cal Office in the form of itineraries and locations of halting-places the elements suitable for the preparation of a new map, more in accordance with the present progress.

The Mining Service under the direction of Captain Monneyres has been assiduous in keeping the Topographical Department informed of everything learned through reports from its agents and from prospectors.

Before the occupation by the French but little was known of the geography of Madagascar. Missionaries traversed it, and made some limited explorations on the line of their journeys. Naturalists in search of collections also furnished information, and frequently paid with their lives their devotion to science; but not until now could it be said that the mapping of the island was seriously undertaken.

About the close of the year 1902 a map of Madagascar, on a scale of $\frac{1}{1000000}$, engraved and in colours, was ready to be struck off, and it was published in its entirety early in 1903. There is a new map on a scale of $\frac{1}{500000}$ now in press, so arranged that blank spaces are left to be filled up by information received at the last moment. This new map, in seven colours, consists of 20 sheets, five of which are already issued.

In 1902, Governor-General Gallieni, who is an enthusiast on the subject, ordered a general atlas of Madagascar to be prepared. The work was immediately put in hand by his staff; but the numerous changes that had to be made in order to render the work as exact as possible have delayed its publication, and it will be issued in 1905. This atlas will contain about 40 engraved maps, in colours.

The drafting and engraving connected with the Topographical Offices in Madagascar are done entirely by Malagasy, and their work in the edition of the map on a scale of $\frac{1}{1000000}$ was truly remarkable. It may be said that it will compare very favourably with the publications of the best French houses in map productions.

Besides these maps the Topographical Bureau has published a new temporary map of the stages and halting-places of the roads intersecting Madagascar on a scale of $\frac{1}{1000000}$, and in addition has produced for the official publications of the colony some 300 maps, representing more than half a million copies.

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